CLAIMS:

1. An electron gun comprising an electron emission cathode, a control electrode and an extractor wherein the electron emission cathode is made of rare earth hexaboride and a tip of the electron emission cathode is located between the control electrode and the extractor.

2. The electron gun according to Claim 1, wherein an electron emission surface of the electron emission cathode is spherical.

3. The electron gun according to Claim 2, wherein the apex angle of the tip portion of the electron emission cathode is 50 - 100°.

4. The electron gun according to Claim 3, wherein the rare earth hexaboride is lanthanum hexaboride.

5. The electron gun according to Claim 1, wherein an electron emission surface of the electron emission cathode is flat.

6. The electron gun according to Claim 5, wherein the apex angle of the tip portion of the electron emission cathode is 50 - 100°C.

7. The electron gun according to Claim 6, wherein the electron emission cathode is made of a single crystal of rare earth hexaboride and the electron emission surface of the electron emission cathode has a <100> face.

8. The electron gun according to Claim 7, wherein the rare earth hexaboride is lanthanum hexaboride.

9. The electron gun according to Claim 1, wherein the electron emission cathode is located between two heaters made of carbon so that the electron emission cathode is heated by feeding an electric current to the electron emission cathode and the heaters.

10. The electron gun according to Claim 9, wherein the carbon used for the heaters is pyrolytic carbon.

11. The electron gun according to Claim 1, wherein an angular intensity of 0.2 - 70 mA/sr is provided in the application of a driving voltage of 1 kV.

12. A method of using an electron gun constituted by an electron emission cathode, a control electrode and an extractor wherein the electron emission cathode is made of rare earth hexaboride and a tip of the electron emission cathode is located between the control electrode and the extractor, the method being characterized in that the electron emission cathode is operated in a temperature limited region.

13. The method of using an electron gun according to Claim 12, wherein the electron emission cathode is operated at 900 - 1900K.

14. The method of using an electron gun according to Claim 11, wherein the electron emission cathode is operated in a pressure range of 1×10^{-5} Pa or less.